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# Seeds of Iowa noxious and common weeds

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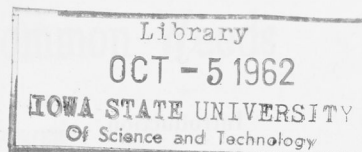
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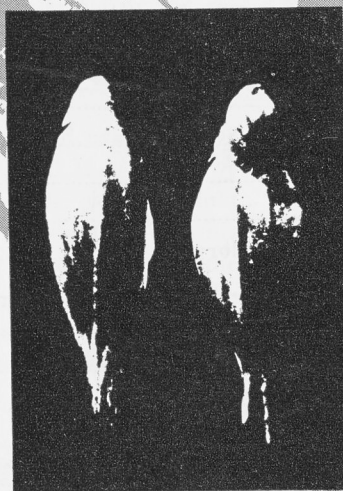
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# SEEDS

## OF IOWA NOXIOUS AND COMMON WEEDS



Agricultural and Home Economics Experiment Station,  
IOWA STATE UNIVERSITY of Science and Technology

Cooperative Extension Service, cooperating  
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# Seeds of Iowa Noxious and Common Weeds

BY DUANE ISELY AND W. H. BRAGONIER\*

Weeds are one of the most serious problems faced by the American farmer. Losses due to weeds are estimated at 3 billion dollars annually in the United States.

The best way to control weeds is to stop them before they reach the farm. This is true of both noxious weeds and the so-called common weeds which are too frequently taken for granted. It is much easier and cheaper to prevent these pests from establishing themselves than to eradicate them. The seeds of a few kinds of weeds can be carried long distances by natural means. For instance, dandelion seeds are wind-transported; cockleburs and stickweeds are carried by animals.

But the seeds of most weeds are spread by man, most commonly planted with crop seed. A good example is the spectacular spread of giant foxtail. Ten years ago this weed was rare in Iowa. Now it is one of the major late summer grassy pests throughout much of the southern half of the state. Giant foxtail has been a successful hitchhiker, mostly with weed-polluted legume seed. It is still on the move, county to county, farm to farm.

Many individuals can recognize our worst weeds by appearance. If these weeds show up in fields, their presence is soon noted and control measures can be taken. But control can often begin a step earlier if weed seeds are recognized when found in other seed.

The identification of weed seeds is admittedly more difficult than knowing the plants. It is primarily the responsibility of seed specialists. Nonetheless, many farmers and agricultural leaders recognize some seeds and wonder about others.

Agricultural seed should be tested and examined for weed seeds before it goes into the soil.<sup>1</sup> If a farmer is buying seed or planting homegrown seeds, he should find out what and how many weed seeds he is putting into his soil. If he is selling seed, he needs a test (1) because the law requires it, (2) for his own protection in case the purchaser obtains a poor stand because of cultural conditions, or finds new weeds in his fields which might be attributed to the seed planted.

## Iowa Weed and Seed Laws

The Iowa Agricultural Seed Law, administered by the Iowa Department of Agriculture in Des Moines, aids in weed control by restricting the sale and distribution of

agricultural seed containing undesirable weed seeds. The law designates the seeds of certain weeds as "noxious weed seeds" and classifies them as "primary noxious" and "secondary noxious."

The primary noxious weeds are persistent pests, extremely difficult to eradicate once well established. They include Canada thistle, quackgrass, perennial sowthistle, perennial peppergrass, Russian knapweed, horsenettle, field bindweed and leafy spurge. *It is illegal to sell agricultural seed containing seeds of any primary noxious weeds.*

Secondary noxious weeds are also serious pests. They cause serious yield losses and are difficult to control, especially in crops (soybeans, legumes) in which selective herbicides are not practical. Some of these weeds may become abundant in corn after layby or after oat harvest. The secondary noxious weeds include buckhorn, dodder, wild carrot, mustards, docks, sheep sorrel, butterprint and cocklebur. Agricultural seed containing such seeds can be sold providing (1) the name and number (above certain specified minimums) per ounce or per pound of agricultural seed of each secondary noxious seed kind is clearly indicated on a tag or label, and (2) the total weed seed content (both noxious and common weeds) does not exceed 1½ percent of the whole by weight.

The Iowa Weed Law, a regulation separate from the seed law, empowers the state to enforce the control of noxious weeds. The list of weeds declared noxious under this law is similar but not identical to that under the seed law. All thistles are considered noxious under the weed law, whereas only Canada thistle is included in the seed law. Puncture vine and buckthorn (a shrub) are also included in the weed law. On the other hand, dodder, secondary noxious in the seed law, is not included in the weed law; the seed law designates all species of mustard (*Brassica*) as secondary noxious; the weed law includes only wild mustard (*Brassica kaber*).<sup>2</sup>

## What Is a Seed?

Seeds mature within a fruit. For example, soybean seeds mature in a pod. Soybean and clover seeds are true seeds. But many structures popularly called seeds are actually more than that. The "seeds" of corn and smartweeds are fruits which enclose a single seed; those of oats,

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<sup>1</sup> Instructions for submitting seed samples for testing are included in FS-786, "Make Sure Your Seed Is Best by Test."

<sup>2</sup> Copies of the Iowa Agricultural Seed Law and the Iowa Weed Law may be obtained from the Iowa Department of Agriculture, Des Moines.



brome and ragweed are further enclosed by some extra hulls.

In this bulletin we will use the word "seed" in the popular sense. Following this usage, a seed is the germ-containing structure which separates from a parent plant at maturity and is capable of developing into a new plant.

### Difficulties in Identifying Seeds

Weed seeds are not as easily identified as the full-grown plant. Many of them are quite small, and a reading glass or hand lens (as noted in the text) is often necessary. From the standpoint of identification it would be convenient if all weed seeds were the size of coconuts, but this isn't the case.

Many weed seeds have different appearances depending on whether the outer hulls have been stripped off during harvesting and cleaning. This complicates recognizing and describing a given kind.

Lastly, we deal with technical terms. We have used a few. One can't talk about an automobile intelligently without using a few words such as steering wheel and carburetor. The same is true when we discuss weed seeds. Technical words are defined in a short glossary on page 23.

These difficulties are not beyond a high school student studying agriculture if he wants to learn about weed seeds.

### Common Weeds Also Important

The first pages of this bulletin are devoted to weed seeds which are noxious under the Iowa weed and seed laws. Since the seeds of some common weeds and crop plants are easily confused with noxious weed seeds, they are compared with noxious seeds. The latter pages treat seeds of some of our most common annual weeds. None of these are noxious—at least by law. But look at Iowa corn and soybean fields! The common weeds are the annuals. Frequently they are grasses—foxtails, witchgrass, crabgrass. Or they may be broad-leaved weeds—smartweeds and pigweeds. These play a major role in reducing yields and require continued cultivation or chemical treatment.

## DESCRIPTIONS OF NOXIOUS WEED SEEDS

### QUACKGRASS (*Agropyron repens*)

(Figures 1, 2 and 3)

*Status Under Iowa Law.* Seed law: primary noxious. Weed law: primary noxious.

*Other Common Names.* None.

*How Produced.* Quack produces numerous seeds in terminal spikes similarly to wheat. The individual seeds are in clusters (spikelets). They may remain together

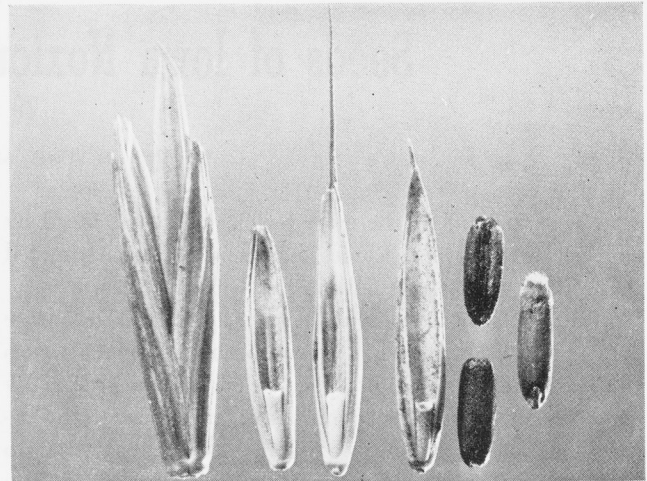


Fig. 1. Quackgrass. Left, seed cluster (spikelet). Center, single seeds. Right, hulled grains. (Magnified 6 times actual size.)

after separation from the parent plant or each may be completely free.

*Size.* Unhulled seeds 5 to 7 mm. long, 1 to 1.5 mm. wide. Hulled seeds 2.5 to 4 mm. long, 1 to 1.2 mm. wide.<sup>3</sup>

*Shape and Appearance.* Unhulled quack seeds are similar to those of ryegrass, meadow fescue or wheatgrass. They are narrowly oblong, somewhat flattened or boat shaped. The top end of the seed commonly bears a stiff bristle; this structure, however, is usually broken off during threshing. At the other end of the seed is a short stalk (the rachilla) attached at the base, extending upward and pressing against the face of the seed. This rachilla is important in distinguishing seeds of quack and similar grasses.

Hulled quackgrass seeds sometimes occur in clover or

<sup>3</sup> One inch equals 25 mm. or 2.5 cm.; 3 mm. equals  $\frac{1}{8}$  inch. A scale comparing English and metric measurements is included on page 22.

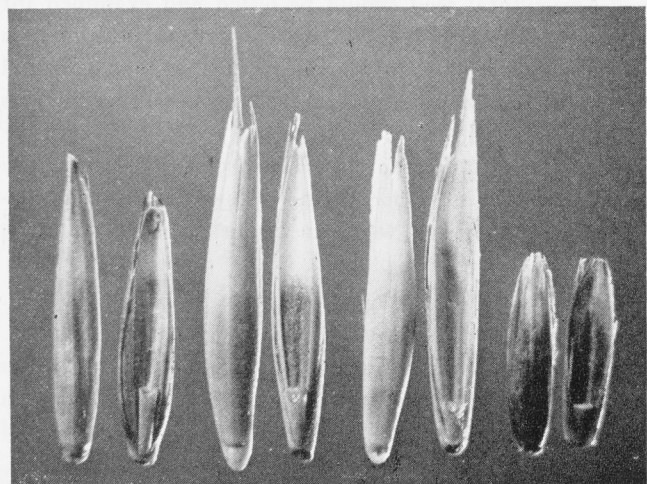


Fig. 2. Quackgrass and other similar seeds. From left to right, quackgrass, western wheatgrass, slender wheatgrass, perennial ryegrass. (Magnified 6 times actual size.)

alfalfa. These, illustrated in fig. 1, look very much like miniature wheat grains. However, most of these seeds are injured and not capable of growth. The embryo, which must be intact to produce a new plant, is often broken or completely chipped out during the cleaning process.

In oats quackgrass may be in clusters or spikelets of 2 to 5 attached seeds. (See fig. 1.) Usually the lowermost seeds in these spikelets are viable, while the upper seeds are only partially developed.

*Seeds With Which Quackgrass May Be Confused.* (See figs. 2 and 3.) Quackgrass seeds are similar to several small-seeded grasses. Fescue (*Festuca* spp.) and ryegrass (*Lolium* spp.) seeds resemble quack but are broader and shorter. Positive identification can be made by examining seeds closely at the end where the rachilla is borne. By turning the seed so that the rachilla or front side is downward, a distinct, narrow, crosswise furrow just above the base of the seed can be seen on ryegrass and meadow fescue (magnification is necessary). This furrow is absent or poorly developed in quack; instead, a raised area or bulge is frequently present.

Seeds of western wheatgrass (*Agropyron smithii*) and slender wheatgrass (*A. trachyculum*) are so similar to quack seeds that good distinctions can scarcely be made on the basis of general appearance. Detailed examination of the rachilla perhaps offers the best way of distinguishing these seeds. (See fig. 3.) In quackgrass this structure is nearly the same width at the top and at the bottom. It is covered with very short hairs that can scarcely be seen except under strong magnification. In western wheatgrass the rachilla appears narrower at the base than at the top. Slender wheatgrass has an apically enlarged rachilla covered by long silky hairs which can be seen even under rather weak magnification. Other differences between these seeds exist, but they are difficult to recognize

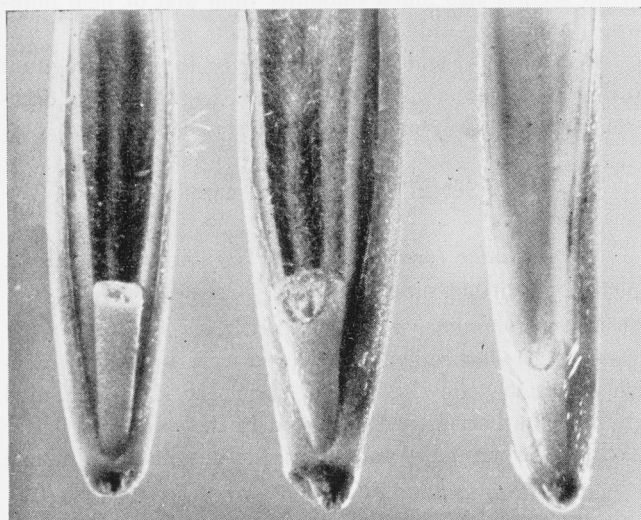


Fig. 3. Quackgrass and similar seeds, enlargement of rachilla region. Left, quackgrass. Center, western wheatgrass. Right, slender wheatgrass. (Magnified 16 times actual size.)

if one is not intimately familiar with the seeds.

*Occurrence.* Quackgrass is most common in the northern half of Iowa. Its seeds may be found in seed oats, various grasses and clovers.

#### PERENNIAL PEPPERGRASS (*Cardaria draba*, formerly *Lepidium draba*)

(Figure 4)

*Status Under Iowa Law.* Seed law: primary noxious. Weed law: primary noxious.

*Other Common Names.* White top, hoary cress.

*How Produced.* The seeds are produced in small, papery, somewhat heart-shaped pods. They mature from midsummer until fall.

*Size.* About 2 mm. long and 1 to 1.6 mm. wide.



Fig. 4. Left, perennial peppergrass. Right, field peppergrass. (Magnified 7 times actual size.)

*Shape and Appearance.* Perennial peppergrass seeds are rather ellipsoidal in side view but are somewhat flattened. They are more pointed at one end than at the other. A distinct furrow running down each of the flattened sides to the pointed end can usually be observed. Commonly there is a small mass of whitish scurfy material attached to the narrow end of the seed. The seeds are reddish-brown with a nearly smooth surface. Under a hand lens they appear finely granular.

*Seeds With Which Perennial Peppergrass May Be Confused.* Perennial peppergrass seeds are not likely to be confused with those of any of our common weeds with the exception of field peppergrass (*Lepidium campestre*), a related winter annual weed. Field peppergrass seeds are approximately the same width and shape as those of perennial peppergrass but are considerably less flattened. They are usually a dark chocolate-brown or black-brown and have a more coarsely granular seed coat than perennial peppergrass. In most cases, field peppergrass can be distinguished from perennial peppergrass by color alone. However, the shape and surface of the seeds should be examined, since slightly immature seeds of perennial peppergrass may turn dark on drying, and one occasionally sees light seeds of field peppergrass.

*Occurrence.* Perennial peppergrass is local, occurring



in scattered areas, primarily in the western half of the state. It is not often seen in agricultural seed grown in Iowa.

### LEAFY SPURGE (*Euphorbia esula*)

(Figure 5)

*Status Under Iowa Law.* Seed law: primary noxious. Weed law: primary noxious.

*Other Common Names.* None.

*How Produced.* The seeds are borne in a three-chambered and three-lobed capsule-like fruit. Each fruit bears three seeds, one to each chamber. The seeds are usually ripe in the early or middle part of the summer. When ripe they are discharged from the capsule by an explosive mechanism which scatters them several feet from the parent plant.

*Size.* About 2 mm. long, 1.5 mm. wide.

*Shape and Appearance.* The seeds of leafy spurge are ellipsoidal or somewhat football-shaped. They possess a distinct longitudinal seam or line which runs from end to end on the seed. The surface is smooth or finely granular and has a grayish-white, marbled appearance. Slightly immature seeds may be brownish blotched.



Fig. 5. Left, leafy spurge. Right, flowering spurge. (Magnified 9 times actual size.)

*Seeds With Which Leafy Spurge May Be Confused.* The seeds of the leafy spurge are similar to those of a related plant known as flowering spurge (*Euphorbia corollata*). Seeds of the flowering spurge are nearly the same size and shape as those of the leafy spurge but usually appear dull-white, sometimes giving the impression of having been rolled in flour. Flowering spurge seeds frequently have scattered irregular ridges or lines on the surface.

*Occurrence.* This plant is most strongly established in the northwestern portion of Iowa but occurs in scattered areas over the entire state.

### FIELD BINDWEED (*Convolvulus arvensis*)

(Figure 6)

*Status Under Iowa Law.* Seed law: primary noxious. Weed law: primary noxious.

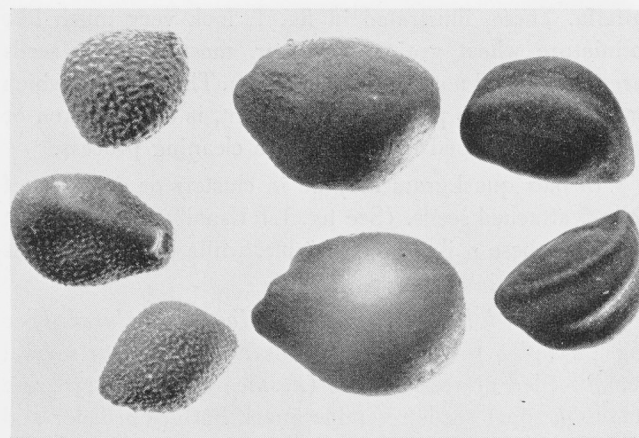


Fig. 6. Field bindweed and similar seeds. Left, field bindweed. Center, hedge bindweed. Right, wild morning-glory. (Magnified 7 times actual size.)

*Other Common Names.* Creeping Jenny, European bindweed, bindweed.

*How Produced.* Several seeds are borne clustered together in a capsule. They mature from midsummer until late fall.

*Size.* Seeds 3 to 4 mm. long and approximately 2 mm. wide.

*Shape and Appearance.* The seeds of field bindweed roughly approximate the shape of an orange section. They have a curved back and two more or less flat sides that come together in a straight line. The seeds are smoky-gray and appear rough on the surface. With a little magnification they show fine prominences or warts.

*Seeds With Which Field Bindweed May Be Confused.* Plants known as wild morning-glory (*Ipomoea* spp.) and hedge bindweed (*Convolvulus sepium*) have seeds similar to those of field bindweed. The seeds of these non-noxious weeds, however, average considerably larger than those of the field bindweed and are black in color. The surface of the seed is also much smoother than that of field bindweed, appearing only finely roughened, not warty.

*Occurrence.* Field bindweed may be found throughout Iowa, most commonly in the west. Its seeds are occasionally found in small grain and soybean seeds.

### HORSENETTLE (*Solanum carolinense*)

(Figure 7)

*Status Under Iowa Law.* Seed law: primary noxious. Weed law: primary noxious.

*Other Common Names.* Bull nettle.

*How Produced.* Horsenettle seeds are borne in greenish-yellow to yellowish berries about the size of a small cherry. The berries are produced in the middle or latter part of the summer, and the seeds are mature by late summer.

*Size.* Seeds 2 to 3 mm. across, about 0.3 to 0.5 mm. thick.

*Shape and Appearance.* The seeds of this plant are



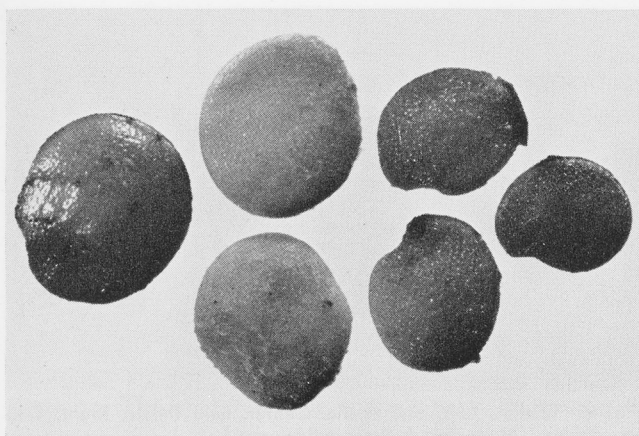


Fig. 7. Left, horsenettle. Right, ground cherry. (Magnified 8 times actual size.)

more or less flattened or disk-shaped; in outline they are rounded or irregularly angled. The surface is yellowish or yellow-brown, shiny or dull, and finely marked by small pits or inconspicuous curving lines. Occasionally the outside of the seed is partially obscured by dried, blackened fragments of the berry pulp in which the seed was originally produced.

*Seeds With Which Horsenettle May Be Confused.* Horsenettle seeds are very similar to those of the ground cherries (*Physalis* spp.). There are several species of *Physalis* in Iowa, none of which are noxious weeds. Ground cherry seeds are usually somewhat smaller than those of horsenettle. They are more evenly rounded or symmetrical and have a rougher and definitely pitted surface. These characteristics, however, are variable and cannot always be relied upon unless one has had considerable experience in distinguishing the seeds. Inasmuch as the correct identification of horsenettle seeds is rather important to the grower or potential purchaser of agricultural seed, doubtful material should be submitted to the Iowa State University Seed Laboratory for verification.

*Occurrence.* Horsenettle may be found in nearly all Iowa counties, but is most common in the south. The seeds are occasionally found in red clover and grass seed lots. Sometimes entire berries may be found in soybeans or oats. Southern-grown Korean lespedeza is particularly apt to carry horsenettle.

#### RUSSIAN KNAPWEED (*Centaurea repens*)

(Figure 8)

*Status Under Iowa Law.* Seed law: primary noxious. Weed law: primary noxious.

*Other Common Names.* None.

*How Produced.* The seeds of this plant are borne in a cluster in a manner similar to that of Canada thistle. Seeds are matured from the middle to the end of summer.

*Size.* Russian knapweed seeds are approximately 3 mm. in length and 1.5 to 2 mm. wide.

*Shape and Appearance.* The seeds are oblong or ellipsoidal, straight or slightly curved. They are conspicuously plump or somewhat flattened, usually broader at one end than the other, and commonly have inconspicuous longitudinal lines, angles or ridges. The surface is nearly smooth and is generally light gray or cream-colored. Immature (and usually nonviable) seeds are sometimes a dull reddish-brown.

*Seeds With Which Russian Knapweed May Be Confused.* Russian knapweed seeds should not be confused with those of any common Iowa weeds.

*Occurrence.* Russian knapweed is rare in Iowa. It may be found in a few areas in the western part of the state. We have seen very few samples of agricultural seeds infested with seeds of this pest.



Fig. 8. Russian knapweed. (Magnified 12 times actual size.)

#### CANADA THISTLE (*Cirsium arvense*)<sup>4</sup>

(Figure 9)

*Status Under Iowa Law.* Seed law: primary noxious. Weed law: primary noxious.

*Other Common Names.* None.

*How Produced.* The seeds of Canada thistle are borne together in spiny clusters, each cluster being produced by a single flower head. They usually mature about the middle of the summer. Canada thistle frequently does not produce a good seed set. There are two reasons for this. First, there are two kinds of Canada thistle plants. One kind produces pollen only; the other does not produce pollen but will set seeds if pollen-producing plants grow in the vicinity. In many cases, only one type of plant grows in an infested area, and hence no seeds are produced. Also, Canada thistle has several insect enemies

<sup>4</sup> All species of thistles (*Cirsium* and *Carduus*) are designated as noxious under the weed law. The species treated in this bulletin are those having agricultural significance. Seeds of other kinds do not (or very rarely) occur in Iowa crop seed.

which in some years are capable of destroying most of the seeds.

*Size.* Seeds 2 to 3 mm. long and about 1 mm. wide.

*Shape and Appearance.* Seeds of Canada thistle are oblong, straight or slightly curved longitudinally. In cross-section they may be round or somewhat flattened. They are slightly narrowed at one end. At the other end there is an apical depression surrounded by a narrow flange or collar. In the center of the depression is a little stalked knob (the remains of the flower stigma). This knob is usually evident in hand-harvested samples but often destroyed in crop seed samples. From the flange, around the edge of the depression, arises a cluster of fine feathery bristles similar to those commonly seen on the dandelion. When Canada thistle seeds are found with crop seeds these bristles have usually been destroyed by combining or cleaning processes. Canada thistle seeds are dull- or yellowish-brown except for a very narrow yellowish band on the flange around the apical depression.

*Seeds With Which Canada Thistle May Be Confused.*

Canada thistle seeds have the same general shape and appearance as those of several of our less harmful weedy thistles but may usually be distinguished by their smaller size. The seeds of the field thistle have a wide and distinct yellow band at the apex (the broad end), and most commonly have a reddish-brown streaked surface rather than the solid brown typical of Canada thistle. Bull thistle seeds are ordinarily finely black streaked or blotched over a light background. The seeds of these thistles usually mature considerably later in the season than Canada thistle.

*Occurrence.* Canada thistle may be found throughout Iowa but is most common in the northern part of the state. The seeds fortunately are not abundant in agricultural seeds, probably due to the frequent failure of seed production. They are most commonly found in seeds of red clover and oats.

**BULL THISTLE** (*Cirsium vulgare*,  
formerly *Cirsium lanceolatum*)  
(Figure 9)

*Status Under Iowa Law.* Weed law: primary noxious. Not included in seed law.

*Other Common Names.* Thistle.

*How Produced.* The seeds are produced within large spiny heads in a manner similar to that of Canada thistle. They mature in late summer or fall.

*Size.* About 4 mm. long and 1.5 mm. wide.

*Shape and Appearance.* Seeds oblong, straight or slightly curved longitudinally, usually tapered toward one end and blunt at the other. In cross-section the seeds are elliptic or somewhat flattened. At the blunt end of the seed is a depression from which arises a cluster of hairs as in Canada thistle; these hairs do not persist on seeds

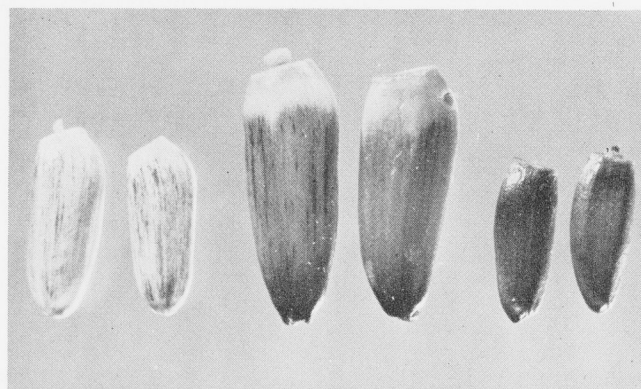


Fig. 9. Thistles. Left, bull thistle. Center, field thistle. Right, Canada thistle. (Magnified 6 times actual size.)

which have been processed along with crop seeds.

The seeds present a somewhat streaked or mottled appearance, having a gray- or ivory-colored background covered by irregular longitudinally directed black lines. The amount of this black streaking varies from seed to seed. Some are almost entirely ivory-gray and others nearly black. The surface is smooth. There is a narrow yellow band or collar encircling the apical depressed area at the end of the seed.

*Seeds With Which Bull Thistle May Be Confused.* Bull thistle seeds may be confused with those of Canada thistle and field thistle. The differences are discussed under Canada thistle.

Bull thistle seeds may also bear a superficial resemblance to immature seeds of the musk thistle. See description of the latter on page 9.

*Occurrence.* Bull thistle seeds are occasionally found in clover seeds and sometimes occur in small grains or grasses.

**FIELD THISTLE** (*Cirsium altissimum*)  
(Figure 9)

*Status Under Iowa Law.* Weed law: primary noxious. Not included in seed law.

*Other Common Names.* Tall thistle, pasture thistle, bull thistle.

*How Produced.* The seeds are borne in large spiny heads as in bull thistle. They mature in late summer.

*Size.* 4.0 to 4.5 mm. long; 1.8 to 2.5 mm. wide.

*Shape and Appearance.* These seeds are similar to those of the two thistles described above, differing in the larger size, broad yellow band at the top, and the brown streaking.

*Seeds With Which Field Thistle May Be Confused.* Field thistle, bull thistle and Canada thistle are compared under description of the latter.

*Occurrence.* Although the weed is abundant throughout Iowa, field thistle seeds are not common in crops.



**MUSK THISTLE** (*Carduus nutans*)

(Figure 10)

*Status Under Iowa Law.* Weed law: primary noxious. Not included in seed law.

*Other Common Names.* Plumeless thistle.

*How Produced.* The seeds are formed in heads as in other thistles.

*Size.* 3.5 to 4.0 mm. long; 1.5 to 1.8 mm. wide.

*Shape and Appearance.* The seeds of musk thistle resemble those of the above kinds in general shape. The knob at the tip, often persistent, is usually larger than in the other species, essentially covering the apical depression. The color and the surface vary, depending on maturity. Small immature seeds are often brownish, resembling Canada thistle. Better developed seeds show

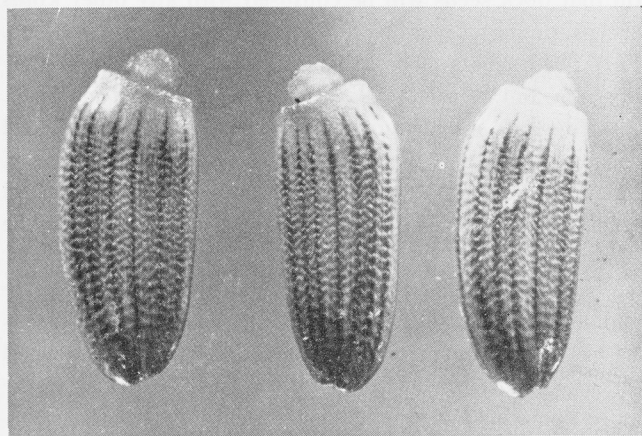


Fig. 10. Musk thistle. (Magnified 10 times actual size.)

longitudinal brown streaks upon a pale yellow background. Magnification indicates that these streaks are composed of rows of dots. Fully mature seeds are often glossy and somewhat cross-wrinkled as well as streaked.

*Seeds With Which Musk Thistle May Be Confused.* The best identification characters of musk thistle seeds are the longitudinal lines, the large knob, and often the cross-wrinkled appearance. Immature brown seeds may resemble those of Canada thistle but are usually larger and show some evidence of the dotted lines. Bull thistle seeds resemble those of musk thistle in size but possess continuous black lines or streaks. Field thistle seeds are larger and have a wide yellow band around the top.

*Occurrence.* Musk thistle seeds are rarely found in Iowa-grown crops. They sometimes occur in seeds shipped in from other regions. The weed seems to be becoming more prevalent in the state, particularly in the central-western part.

**PERENNIAL SOWTHISTLE** (*Sonchus arvensis*)

(Figure 11)

*Status Under Iowa Law.* Seed law: primary noxious. Weed law: primary noxious.

*Other Common Names.* None.



Fig. 11. Left, perennial sowthistle. Right, annual sowthistle. (Magnified 10 times actual size.)

*How Produced.* Each of the large, yellow, perennial sowthistle flower heads produces a cluster of seeds in a manner similar to that of dandelion or Canada thistle. The seeds may mature throughout the summer.

*Size.* Length, 2.5 to 3.0 mm.; width, 1.2 to 1.3 mm.

*Shape and Appearance.* The seeds of this weed are oblong, although slightly narrowed at each end. In cross section they are elliptical or somewhat flattened. The seeds are brownish to red-brown and are conspicuously roughened by a series of distinct longitudinal ridges and irregular cross wrinkles. At the top end there is a cup-like depression from which arises a feathery cluster of hairs similar to that borne by dandelion seeds. These hairs are usually destroyed when the sowthistle heads are cut and processed with crop seed.

*Seeds With Which Perennial Sowthistle May Be Confused.* A closely related plant, the annual sowthistle (*Sonchus oleraceus*), possesses seeds similar to those of the perennial sowthistle. Contrasting characters by which they may be distinguished are as follows (see fig. 11):

**Perennial sowthistle.**

1. Seeds broadest near middle, tapering evenly toward both ends or slightly more strongly tapered toward base.
2. Longitudinal ridges distinct, easy to count.
3. Cross wrinkles distinct on ridges but scarcely discernible in furrows between.

**Annual sowthistle.**

1. Seeds broadest toward the top, strongly tapering to base, somewhat spindle-shaped.
2. Longitudinal ridges often indistinct, merging into one another and difficult to count.
3. Cross wrinkles discernible in furrows as well as on ridges.

*Occurrence.* Perennial sowthistle is found primarily in the north central and eastern parts of Iowa. It is relatively uncommon in crop seeds.

**BUCKTHORN** (*Rhamnus cathartica*)

*Status Under Iowa Law.* Weed law: primary noxious. Not included in seed law.

*Other Common Names.* None. The similarity of the names "buckthorn" and "buckhorn" sometimes cause confusion. They are entirely different plants. Buckthorn, as



discussed below, is a shrub or tree, whereas buckhorn, a secondary noxious weed, is a herbaceous (nonwoody) broad-leaved weed of legumes and waste areas.

*Discussion.* Buckthorn is a large shrub which in past years has been extensively used for hedging and wind-breaks about Iowa farm homesteads. It may also be found in urban plantings.

The Iowa legislature has designated buckthorn a primary noxious weed because it serves as an alternate host for crown rust of oats. One of the more important factors in reducing the prevalence of this serious grain disease is elimination of the buckthorn. Buckthorn seeds, produced in fleshy berries, never occur in crop seed.

#### DOCK (*Rumex* spp.)

(Figures 12, 13 and 14)

*Status Under Iowa Law.* Seed law: secondary noxious. Weed law: secondary noxious.

*Other Common Names.* Two types of dock are noxious in Iowa: sour dock (*Rumex crispus*), also known as curly dock; and smooth dock (*Rumex altissimus*), also called broad-leaf dock.

*How Produced.* The seeds are borne in long, dense clusters at the top of the plant. Each seed (an achene, a one-seeded fruit) is surrounded by three brownish, papery bracts which completely hide it from view.

*Size.* Length, 2 to 2.5 mm.; width, 1 to 1.4 mm.

*Shape and Appearance.* The appearance of dock seeds is dependent upon whether the hulls surrounding them have been destroyed or are still present (see figs. 12 and 13). Dock in clover seed usually does not possess

these appendages. They are torn off during threshing. The seeds are distinctly three-sided and sharply three-angled. They taper to a point at each end. The seed coat is smooth, brownish and shiny. Dock seeds in oats and soybeans, on the other hand, are usually concealed by the hulls. These hulls are brownish, rough and crinkly; many of them may have a swollen tubercle-like structure attached to the back. A curved stalk is often visible at the base of the seed.

Hulled seeds of these two kinds of dock are indistinguishable except that smooth dock seed is slightly larger. Unhulled seeds, on the other hand, are easily distinguished. The hulls surrounding smooth dock seeds are much larger than those of sour dock (see fig. 13).

*Seeds With Which Dock May Be Confused.* It is doubtful that dock seeds will be confused with any other kinds except possibly certain immature smartweeds (see fig. 12). These smartweeds are frequently brown before they are ripe, but assume a blackish color upon full maturity. The edges of smartweed seeds come together in rounded corners rather than sharp angles, as is the case in dock. Small seeds of dock may be confused with sheep sorrel (see fig. 14). The distinctions are discussed under the latter.

*Occurrence.* Docks are common over the entire state and are perhaps the most abundant noxious weed seeds to be found in agricultural seed. They occur in small grains, legumes and grasses. Of the two, sour dock is the more common and widely distributed.

#### SHEEP SORREL (*Rumex acetosella*)

(Figure 14)

*Status Under Iowa Law.* Seed law: secondary noxious. Weed law: secondary noxious.

*Other Common Names.* Red sorrel.

*How Produced.* Seeds of sheep sorrel are borne in dense clusters on an elongated stalk at the top of the plant.

*Size.* About 1 mm. long and approximately the same width.

*Shape and Appearance.* Sheep sorrel seeds possess three sides which taper to a point at each end. These sides come together in three distinct angles. Usually the seeds have a dull-brown, scaly appearance and are almost com-

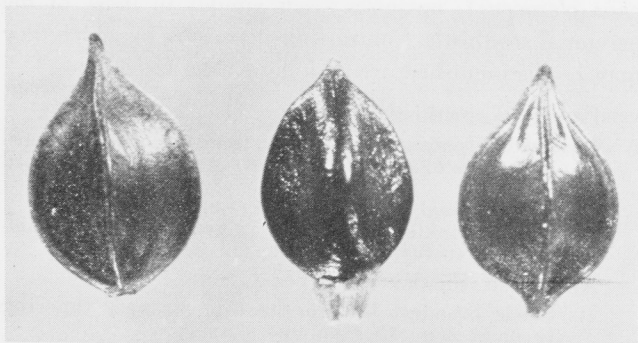


Fig. 12. Docks and smartweed. Left, smooth dock. Center, smartweed. Right, sour dock. (Magnified 15 times actual size.)

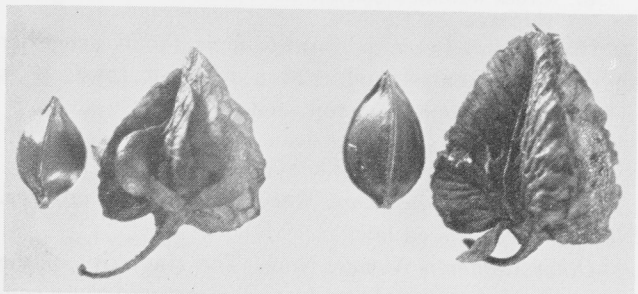


Fig. 13. Dock. Seed and outer hull. Left, sour dock. Right, smooth dock. (Magnified 8 times actual size.)

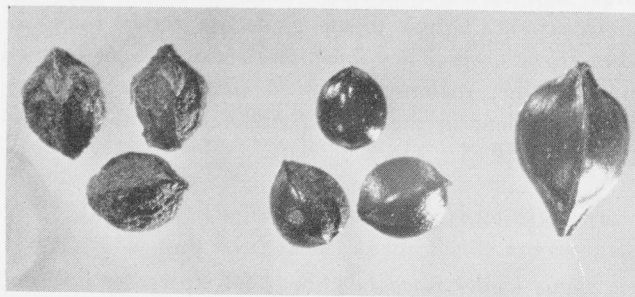


Fig. 14. Sheep sorrel and dock. Left, sheep sorrel with outer hull. Center, sheep sorrel without hull. Right, sour dock. (Magnified 12 times actual size.)

pletely covered by dried brownish remnants of the flowers which produced them. Sometimes, however, this papery covering is scraped off during seed cleaning. In this case, the sheep sorrel seeds appear somewhat smaller and exhibit a shiny, polished, brown surface.

*Seeds With Which Sheep Sorrel May Be Confused.* Sheep sorrel seeds from which the outer covering has been removed may be confused with small seeds of dock. However, the angles of the sides of sheep sorrel seeds are usually rounded, whereas those of the dock seeds are sharp and present an almost knife edge appearance. Usually dock seeds are larger than sheep sorrel.

*Occurrence.* Sheep sorrel is locally abundant. It is perhaps most common in southern Iowa. Seeds may be matured throughout the summer and frequently occur in those of small-seeded field crops.

### MUSTARDS (*Brassica* spp.)

(Figures 15, 16)

*Status Under Iowa Law.* Seed law: secondary noxious. Weed law: secondary noxious (wild mustard only).

*Other Common Names.* Several kinds of weedy mustards are considered noxious under the seed law. The common ones are wild mustard (*Brassica kaber*)<sup>5</sup>, black mustard (*Brassica nigra*) and Indian mustard (*Brassica juncea*).

*How Produced.* Two to four seeds are borne in small fruits similar to bean pods although smaller. Wild and Indian mustard usually mature their seeds in early summer; black mustard in mid- to late-summer.

*Size.* Wild mustard — 1.2 to 1.5 mm. in diameter; black mustard — 1.0 to 1.5 mm. long, 0.9 to 1.0 mm. wide; Indian mustard, about 1.0 to 1.4 mm. in diameter.

*Shape and Appearance.* Mustard seeds vary from spheroidal to ellipsoidal or football-shaped. They are black, blackish-brown or a dull red-brown. The surface is smooth or finely roughened (hand lens examination) by an extensive series of lines which forms a dense network over the surface of the seed. While it is usually sufficient to identify these seeds merely as mustards, for those who are interested, the distinguishing characters are as follows:

Wild mustard—seeds nearly spheroidal, black, smooth.

Indian mustard—seeds brownish; spheroidal to football-shaped; covered with a network of fine lines (hand lens).

Black mustard—seeds brownish to red-brown; football-shaped or ellipsoidal, usually smaller than either of the other two types; covered with a very distinct network of fine lines (hand lens).

*Seeds With Which Mustards May Be Confused.* Indian mustard is a wild form of the cultivated plant which furnishes mustard greens. Their seeds are indistinguishable. If such seeds are found in agricultural seed, they should

<sup>5</sup> Designated *B. arvensis* in weed law.

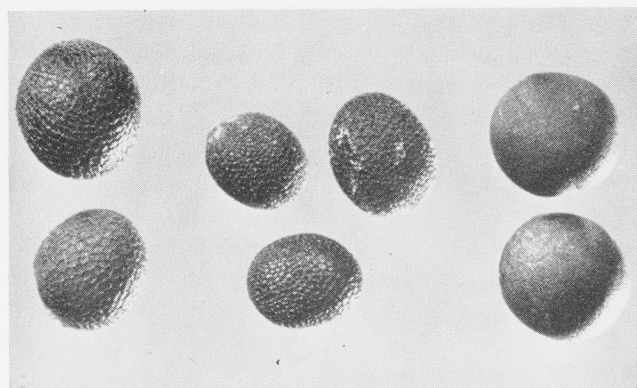


Fig. 15. Mustards. Left, Indian mustard. Center, black mustard. Right, wild mustard. (Magnified 12 times actual size.)

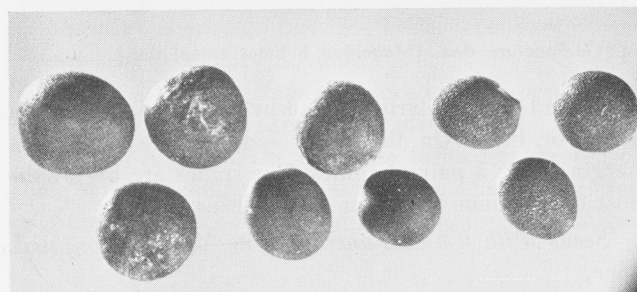


Fig. 16. Left, cabbage. Center, wild mustard. Right, turnip. (Magnified 10 times actual size.)

be considered to be those of the weed; seeds of leaf mustards are not likely to be mixed in with those of field crops. Seeds of cabbage, turnips or rutabagas may be confused with those of the wild mustards (see fig. 16). But the seeds of these cultivated forms are usually somewhat larger (2 to 3 mm. in diameter) than those of their weedy relatives. They are spheroidal or somewhat flattened, black to reddish-brown and usually show a faint network of lines on the surface. These detailed surface markings can be seen only under magnification.

*Occurrence.* Mustards are common over the entire state. Their seeds occur primarily with those of small grains, particularly oats, in which they are sometimes extremely abundant.

### PUNCTURE VINE (*Tribulus terrestris*)

(Figure 17)

*Status Under Iowa Law.* Weed law: secondary noxious. Not included under seed law.

*Other Common Names.* Goathead.

*How Produced.* Puncture vine plants produce spiny burs which at maturity separate into five seed-like segments.

*Size.* Seeds 5 to 7 mm. long; spines 4 to 6 mm. long.

*Shape and Appearance.* Puncture vine seeds are one-seeded bur segments. The true seeds almost never break out of the hard covering of the bur. These seed-like structures (the bur segments) are somewhat flattened and are roughly semicircular in outline. The surface is straw-



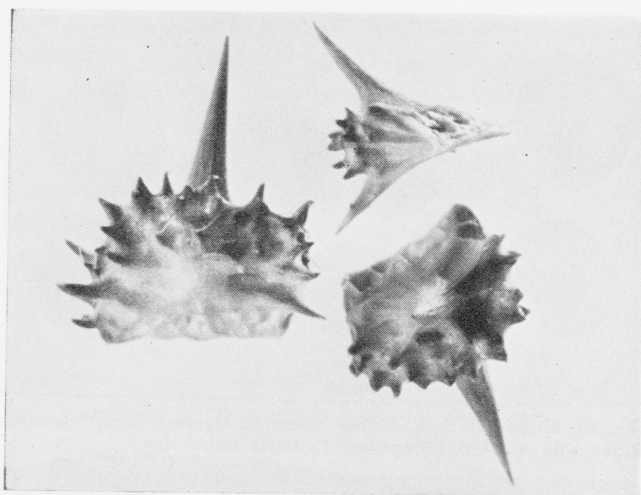


Fig. 17. Puncture vine. (Magnified 5 times actual size.)

brown and is irregularly marked by a network of curving ridges or lines. On the upper side or near the thick margin arises a pair of spines. The spines are by far the most conspicuous character of the seeds.

*Seeds With Which Puncture Vine May Be Confused.* None.

*Occurrence.* Puncture vine is most commonly found in southern Iowa. It rarely occurs in agricultural seeds.

#### WILD CARROT (*Daucus carota*)

(Figure 18)

*Status Under Iowa Law.* Seed law: secondary noxious. Weed law: secondary noxious.

*Other Common Names.* Queen Anne's lace.

*How Produced.* The wild carrot fruit is a bristly sub-spherical or ellipsoidal structure which at maturity splits lengthwise into two pieces, each containing a single seed. The fruits mature in late summer.

*Size.* The seeds are 2.2 to 2.5 mm. long, about 1.2 mm. wide.

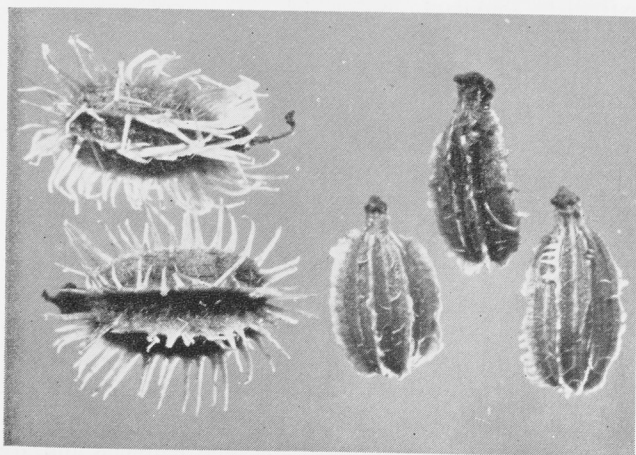


Fig. 18. Wild carrot. Left, seeds with bristles present. Right, seeds with bristles destroyed. (Magnified 10 times actual size.)

*Shape and Appearance.* Wild carrot seeds (the fruit pieces) are somewhat turtle-shaped. They have one flat side and an opposing curved back. The back is conspicuously marked by a series of longitudinal ribs each bearing a line of hooked barbs. However, these barbs are usually entirely broken off on wild carrot seeds which occur with processed agricultural seeds. The ribs are also frequently scraped down so that they appear like low ridges. The seeds are dull-gray and somewhat granular in appearance.

*Seeds With Which Wild Carrot May Be Confused.* If the above-described barbs or bristles are present on wild carrot seeds, they are not likely to be confused with any other type of weed seeds. However, when these are destroyed, the seeds may be confused with those of certain other members of the carrot family. In some cases it is necessary to note the position of the ribs on the back of the seeds. Wild carrot has a very weak rib in the middle of the seed back and much larger ones on either side. Related seeds possess a strong rib placed symmetrically in the middle of the back.

*Occurrence.* The plant occurs to some extent in all portions of Iowa but is most common in the southern part of the state. Its seeds may be found with those of clovers.

#### BUTTERPRINT (*Abutilon theophrasti*)

(Figure 19)

*Status Under Iowa Law.* Seed law: secondary noxious. Weed law: secondary noxious.

*Other Common Names.* Buttonweed, velvet weed, velvet leaf, Indian mallow.

*How Produced.* Several seeds are produced together in a rounded, cup-like seed pod. At maturity, late summer or fall, the pod opens from the top.

*Size.* About 3 mm. long, 2.2 to 2.5 mm. wide, 1 to 1.3 mm. thick. Butterprint seeds, except for cocklebur, are the largest of our noxious weed seeds.

*Shape and Appearance.* Butterprint seeds are flattened

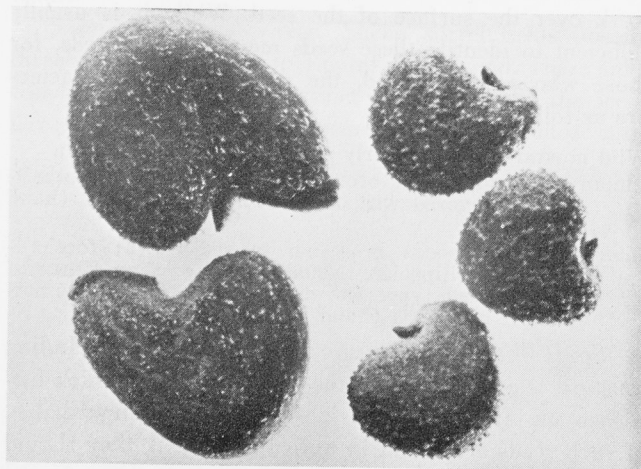


Fig. 19. Left, butterprint. Right, shoofly. (Magnified 10 times actual size.)



so they usually appear to have two faces and a thick edge. In face view the seed is strongly hooked, having one side drawn out into a lobe that is longer than the remainder of the seed. The surface is smooth or slightly roughened, and is gray to whitish-gray. Under a hand lens the seed appears finely granular, like a fine grade of sandpaper.

*Seeds With Which Butterprint May Be Confused.* The seeds of the plant known as shoofly or flower-of-an-hour (*Hibiscus trionum*) are similar to those of butterprint but considerably smaller and plumper. They have fine warts over the surface.

*Occurrence.* Butterprint is extremely common over the state. Its seeds are most commonly found in soybeans.

#### DODDER (*Cuscuta* spp.)

(Figure 20)

*Status Under Iowa Law.* Seed law: secondary noxious. Not included in weed law.

*Other Common Names.* Love vine.

*How Produced.* One to several seeds are formed within small globose pods. They mature from midsummer until frost.

*Size.* The seeds are 1 to 1.5 mm. long, of similar width or somewhat narrower.

*Shape and Appearance.* Dodder seeds vary in shape. They may be spherical, ellipsoidal, football-shaped, or are sometimes irregularly lumpy with several somewhat flattened sides. The surface of well developed seeds is brownish to brownish-gray, sometimes with a faint tinge of green. It is finely roughened, looking like a fine grade of sandpaper under a lens. Frequently a large proportion of the dodder seeds found in agricultural seed are immature or dead. Such seeds are usually dull-gray or even whitish. If pinched with a pair of tweezers, they will usually collapse, leaving only chalky remnants. Since it is obvious that such "seeds" are incapable of producing plants, they should not be reckoned against a given lot of agricultural seed when a noxious weed determination is being made.

Several kinds of dodder occur in Iowa. No attempt will be made to distinguish them in this bulletin.

*Seeds With Which Dodder May Be Confused.* Seeds

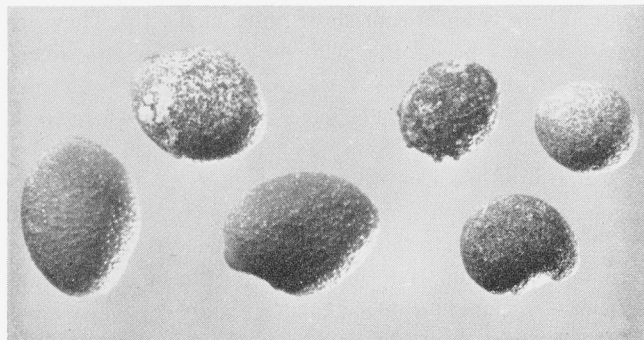


Fig. 20. Left, sour clover. Right, dodder. (Magnified 10 times actual size.)

of sour clover (*Melilotus indica*) may be confused with dodder. Sour clover does not grow in Iowa but is sometimes found in clover or alfalfa shipped in from other sources. Sour clover seeds possess, in side view, a slight indentation toward one end and an indistinct furrow running down the side of the seed. They are an olive-brown and are covered (magnification required) by fine warts or protuberances.

*Occurrence.* Dodder, a parasite, attacks various legumes and flax. Its seed is common in commercial lots of alfalfa and lespedeza seed.

#### BUCKHORN (*Plantago lanceolata*)

(Figure 21)

*Status Under Iowa Law.* Seed law: secondary noxious. Weed law: secondary noxious.

*Other Common Names.* Buckhorn plantain, English plantain, rib grass, narrow-leaf plantain.

*How Produced.* The seeds are formed at the top of a long spike extending above the leaves. They are produced in pairs inside small rounded fruits, maturing throughout much of the summer.

*Size.* About 2 to 2.2 mm. long and 1 mm. wide.

*Shape and Appearance.* Buckhorn seeds are shaped like a dugout canoe, oblong with a hollowed-out middle.



Fig. 21. Plantains. Left, buckhorn, good seed. Center, buckhorn, nonviable seed. Right, bracted plantain. (Magnified 9 times actual size.)

The sides of the "canoe" are rather thick. The surface of mature seeds is a rich, shiny brown except for a broad band of slightly lighter color which extends longitudinally across the back. The seeds become sticky and gelatinous when slightly moistened. Immature or shriveled buckhorn seeds are often found with agricultural seed. Such buckhorn seeds are usually dull-brown or blackish, variously withered or contorted (see fig. 21), and usually incapable of growing.

*Seeds With Which Buckhorn May Be Confused.* Buckhorn seeds are similar to those of bracted plantain (*Plantago aristata*). The latter plant, occurring in southern Iowa, is a very common weed in the southern part of

the United States, where it is usually considered noxious. Its seeds are somewhat broader than those of buckhorn and have thinner sides. There is a conspicuous white line which encircles the inside of the hollowed-out portion. A narrow furrow also runs sideways across the middle of the seed back.

**Occurrence.** Buckhorn plantain is found to some extent throughout Iowa. It is most common in the eastern half of the state. Its seeds frequently occur in those of clovers.

### COCKLEBUR (*Xanthium strumarium*)<sup>a</sup>

(Figure 22)

**Status Under Iowa Law.** Seed law: secondary noxious. Weed law: secondary noxious.

**Other Common Names.** None.

**How produced.** The seeds are formed in pairs within the characteristic spiny burs. They ordinarily are not mature until fall.

**Size.** Burs about 20 mm. in length; seeds 10 to 15 mm. long, 4 to 5 mm. wide.

**Shape and Appearance.** The burs of this plant (see fig. 22) are so familiar that detailed description is unnecessary. The seeds inside are not often seen. They are long and narrow, more or less oblong and flattened. The surface is blackish or brown and marked by several distinct longitudinal lines or ridges.

**Seeds With Which Cocklebur May Be Confused.** None.

**Occurrence.** Cocklebur is very common over the entire state, particularly in low and poorly drained soils. Occasionally the hulled seeds or the entire burs may be found in soybeans.

<sup>a</sup> Designated *Xanthium commune* in weed and seed laws.

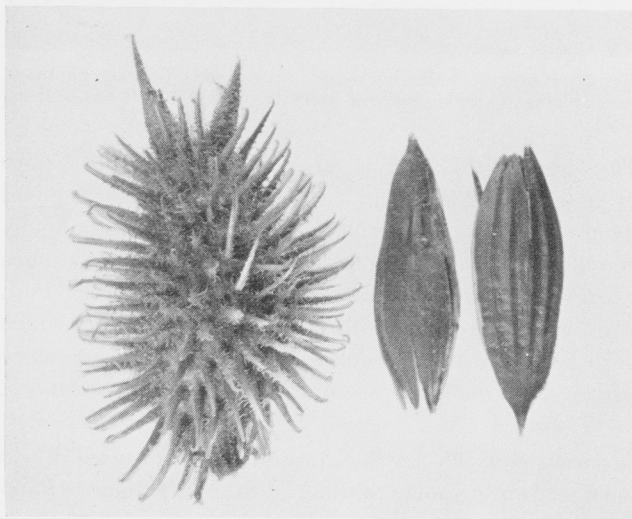


Fig. 22. Cocklebur. Left, bur. Right, hulled seeds. (Magnified 3 times actual size.)

## COMMON WEED SEEDS

The following are not noxious weeds in the legal sense but are the major kinds whose seeds are most frequently found in crop seeds.

### SMARTWEEDS (*Polygonum* spp.)

(Figures 23, 24)

**Other Common Names.** Two kinds of smartweeds are common in Iowa crop seed: common smartweed or ladythumb (*Polygonum persicaria*), and Pennsylvania smartweed (*Polygonum pensylvanicum*).

**How Produced.** The smartweeds have pinkish flowers in spikes. Each flower sets a single seed (one-seeded fruit). The seed remains enclosed by the dried petals. Maturation is in midsummer to fall.

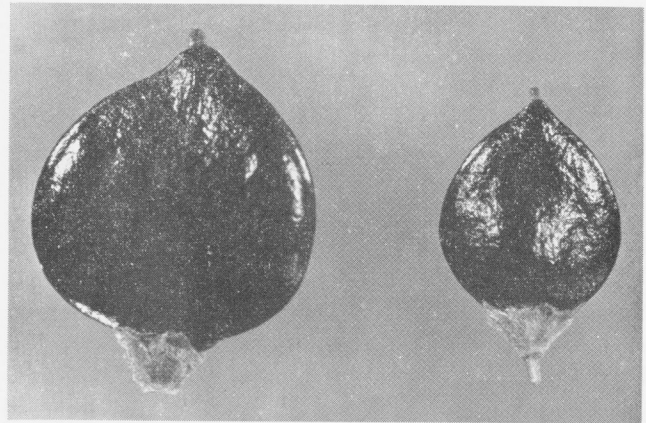


Fig. 23. Smartweeds. Left, Pennsylvania smartweed. Right, common smartweed. (Magnified 13 times actual size.)

**Size.** A well-developed common smartweed seed is about 2.0 to 2.5 mm. long and 1.5 to 2.0 mm. wide. The Pennsylvania smartweed seed is considerably larger, approximately 3.0 mm. in length and often nearly as wide. There is considerable variation in size in both kinds and some seeds, especially immature ones, are smaller than above indicated.

**Shape and Appearance.** The seeds are usually flattened with a rounded edge or margin. Occasionally seeds of common smartweed are three-sided and three-angled. In outline they range from nearly circular to elliptic or ovate. There is an abrupt short point at the tip. They are rounded at the base, often with remains of the attachment stalk or torn remnants of the sepals. Mature seeds are shiny black with a smooth, hard surface; immature seeds are brown.

This description is of the seeds without the enveloping, persistent sepals. Smartweed seeds in soybeans and small grains may retain this extra covering, a papery, pink-tan, thin hull. If rubbed between the fingers it readily comes off and the black seed is exposed to view.

**Seeds With Which Smartweeds May Be Confused.** As noted above, common smartweed sometimes has three-



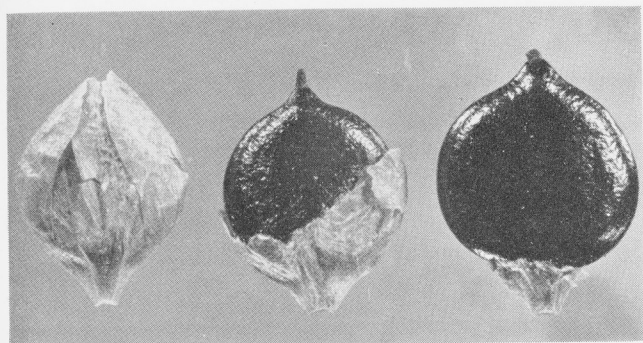


Fig. 24. Pennsylvania smartweed showing various degrees of destruction of the petal hull. (Magnified 10 times actual size.)

angled seeds. These resemble those of the docks (*Rumex* spp.), to which they are related. The dock seeds are brown and have sharply angled edges.

The seeds of certain kinds of sedges—grass-like weeds which grow in heavy soil or wet areas—may resemble those of smartweeds. Sedge seeds occasionally occur in small-seeded grasses, less frequently in legumes. If one is curious about some “smartweed-like” seeds that look somewhat peculiar, they may be cut in half with a razor blade. The germ or embryo of the smartweed can be easily seen. It is quite large and extends the length of the seed along one edge. On the other hand, the germ in the sedge seed is small and difficult to find.

**Occurrence.** Smartweed seeds are among the most frequently encountered weed seeds. They may be found in seeds of nearly all crops except corn.

#### WILD BUCKWHEAT (*Polygonum convolvulus*) (Figure 25)

**Other Common Names.** Black bindweed.

**How Produced.** The seeds are one-seeded fruits surrounded by a flower hull as in the smartweeds and docks. They mature any time from the middle to the end of the summer.

**Size.** About 3 mm. long and 2 mm. wide.

**Shape and Appearance.** The seeds are three-angled and three-sided with a hard, dull black protective coat. The external, closely fitting, scaly-brown flower hull may completely enclose the seed, or it may be destroyed. As

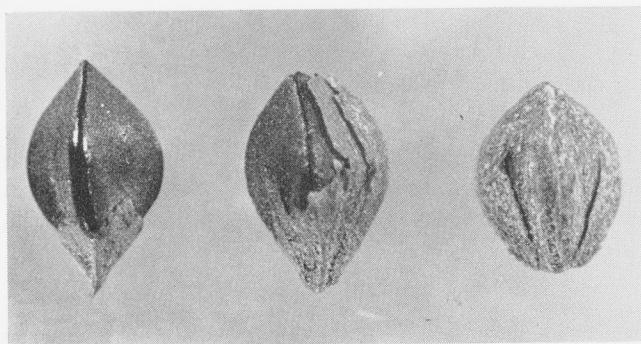


Fig. 25. Wild buckwheat. (Magnified 10 times actual size.)

a result, wild buckwheat seeds often present a variety of appearances.

**Seeds With Which Wild Buckwheat May Be Confused.** Wild buckwheat derives its common name from the cultivated buckwheat because of similarity of the seeds. However, those of the crop plant are considerably larger and are rarely found with other cultivated plants.

**Occurrence.** Wild buckwheat seeds commonly occur in those of oats and soybeans. Because of their large size they are rarely seen in small-seeded legumes and grasses.

#### KNOTWEED (*Polygonum aviculare*) (Figure 26)

**Other Common Names.** None.

**How Produced.** A close relative of the smartweeds, knotweed produces its seeds in similar fashion. Each is a hard, one-seeded fruit (achene), initially surrounded by the dried, petal-like flower envelope.

**Size.** 1.6 to 2.0 mm. long, 0.8 to 1.0 mm. wide.

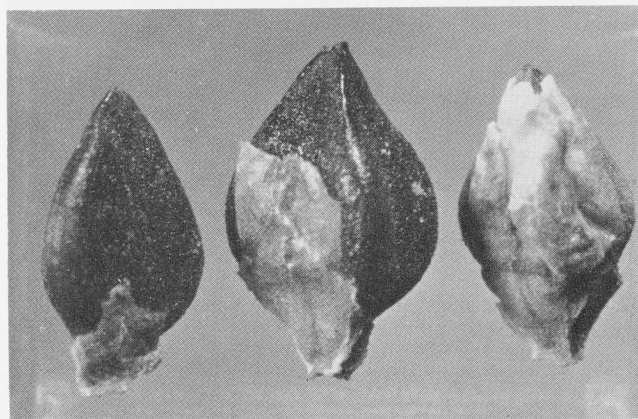


Fig. 26. Knotweed. (Magnified 25 times actual size.)

**Shape and Appearance.** Like the docks and wild buckwheat to which knotweed is related, the seeds are three-angled and three-sided. But compared to the former kinds the seed is slender and tapering; the sides are not always clearly defined and the angles are rounded. The seed coat is dull or slightly shiny light- to dark-brown depending upon the stage of maturity. The hull-like petal covering may be partially or completely destroyed, depending upon the amount of processing. Usually, as in wild buckwheat, a portion of this structure persists, at least at the bottom of the seed.

**Seeds With Which Knotweed May Be Confused.** Knotweed seeds superficially resemble those of wild buckwheat and dock, since all are three-angled. Some of the differences are given in the preceding paragraphs. In addition, knotweed seeds are much smaller than those of wild buckwheat. They do not have the sharply three-angled shape of the docks.

Knotweed might be confused with some of the smart-



weeds. The common smartweeds, treated on page 14, are usually flattened and black. Other smartweeds, less frequently encountered, are three-angled and more closely resemble knotweed. Usually these smartweeds have black seeds, but they may be brown when immature. They are shorter, broader and more decidedly three-sided than knotweed seeds.

*Occurrence.* Knotweed is a fairly frequent contaminant of forage and turf seeds.

#### ROUGH PIGWEED (*Amaranthus retroflexus*)

(Figure 27)

*Other Common Names.* Pigweed, red-root pigweed.

*How Produced.* Pigweeds have a dense, bristly, branched inflorescence which matures hundreds or thousands of seeds. Each seed is individually borne in a tiny capsule, the top of which comes off like a lid. The seeds may be matured any time from midsummer to late fall.

*Size.* About 1 mm. in length and a little less in width.

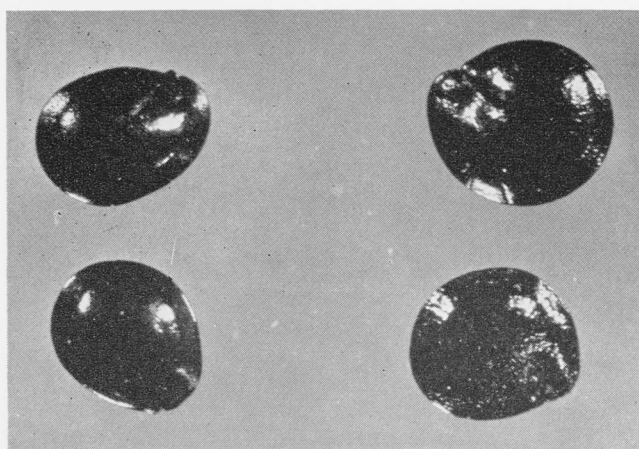


Fig. 27. Pigweed and hulled lambsquarters. Left, pigweed. Right, lambsquarters. (Magnified 22 times actual size.)

*Shape and Appearance.* Pigweed seeds are lens-shaped (flattened with a convex top and bottom) and are nearly circular to ovate (egg-shaped) in outline. Usually they have a small flange or ridge about the margin. The surface is smooth and shiny. The color of the seeds ranges from reddish-black to black, depending upon maturity.

*Seeds With Which Rough Pigweed May Be Confused.* Rough pigweed is the most common of several pigweed-like plants which have almost indistinguishable seeds. They are all usually called "pigweed" when found in crop seed. Prostrate pigweed (*Amaranthus graecizans*) has similar but larger seeds (about 1.5 mm. long).

Lambsquarters seeds (described on this page and page 17) are similar in size and shape to pigweed seeds but usually appear duller.

*Occurrence.* Rough pigweed grows in cultivated soil throughout Iowa, and its seeds are frequently found in those of nearly all agricultural crop seeds.

#### KOCHIA (*Kochia scoparia*)

(Figure 28)

*Other Common Names.* Burning bush.

*How Produced.* The Kochia plant has a much-branched inflorescence which bears innumerable small, one-seeded fruits. The fruit coat forms a persistent brownish husk around the seed (i.e. is indehiscent). The seed ripens from the middle of summer to fall.

*Size.* Length: about 1.5 to 1.8 mm.; width: 1.0 mm.

*Shape and Appearance.* The seeds are somewhat flattened. In face view they are ovate or teardrop shaped. If the true seed is hulled from the fruit coat, it is brown, has a strong ridge around the margin, and has a notch at the narrow end. Enclosed within the fruit coat, the total structure is membranous, tan, often slightly winged, with a scar or point in the middle of the top and bottom. Both of these forms, with or without fruit coat, may be found in crop seed.

*Seeds With Which Kochia May Be Confused.* Kochia is similar in general structure to lambsquarters, a relative. However, it is longer than wide, whereas lambsquarters is nearly circular.

*Occurrence.* Kochia appears throughout Iowa. The seeds are most common in those of small-seeded legumes and grasses.



Fig. 28. Kochia. Left, seed enclosed in flower hull. Center, seed with fruit coat. Right, hulled seed. (Magnified 16 times actual size.)

#### LAMBSQUARTERS (*Chenopodium album*)

(Figure 29)

*Other Common Names.* Goosefoot.

*How Produced.* Lambsquarters flowers are irregularly clustered toward the tips of branches. Each flower sets a small, one-seeded indehiscent fruit which remains enclosed in the flower hulls (sepals). The seeds mature throughout much of the summer.

*Size.* The seeds are approximately 1.0 mm. across.

*Shape and Appearance.* The total fruit and/or seed is roughly disk or lens-shaped. In crop seed, lambsquarters

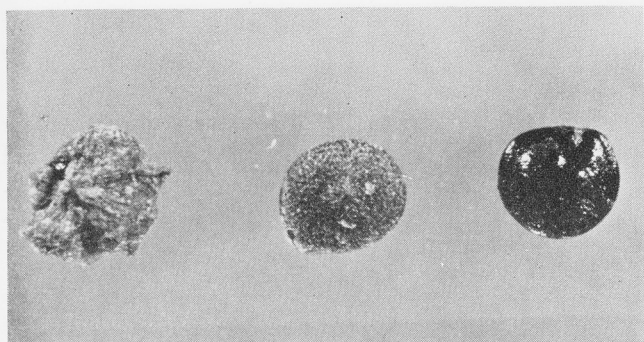


Fig. 29. Lambsquarters. Left, seeds enclosed in flower sepals. Right, seeds with and without fruit hull. (Magnified 15 times actual size.)

seeds may present several appearances, depending upon how much of the extra hulls have been destroyed:

1. The whole fruit surrounded by the flower sepals. These outer hulls, the sepals, are brownish and chaff-like. They form a tight-fitting sac, which encloses the fruit (see fig. 29).

2. The fruit stripped from the flower hull. The fruit is plainly lens-shaped and dull gray to black. Under hand lens magnification it is finely pitted. Many seeds have part of the fruit covering stripped off, with the hard surface of the seed showing through.

3. The true seeds. The seed coat appears hard, dull or shiny black, depending upon how thoroughly the outer coverings have been removed. Often there is a small notch in the margin.

*Seeds With Which Lambsquarters May be Confused.* The hulled out seeds are quite similar to those of pigweed. They are usually less shiny, plumper in the middle and do not have as distinct a rim as pigweed seeds.

*Occurrence.* It is prevalent over the entire state. The seeds are frequently seen in those of nearly all crops.

#### NODDING SPURGE (*Euphorbia nutans*)

(Figure 30)

*Other Common Names.* Spreading spurge, upright spurge.

*How Produced.* The fruit is a three-chambered cap-

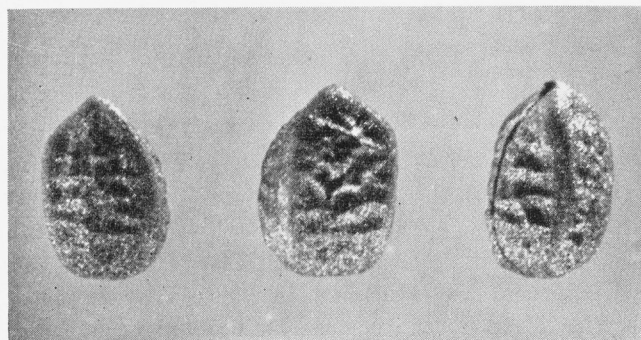


Fig. 30. Nodding spurge. (Magnified 23 times actual size.)

sule. Each chamber contains a single seed. At maturity, in late summer, the fruit releases the seeds.

*Size.* 1.0 to 1.2 mm. long; 0.7 to 0.8 mm. wide.

*Shape and Appearance.* These small seeds are roughly egg-shaped. They have three somewhat rounded longitudinal faces which alternate with broad ribs. A narrow, brownish seam extends the length of one of the faces. The seed coat surface is gray to brown, depending on maturity, and is faintly cross-ridged (with magnification).

*Seeds With Which Nodding Spurge May Be Confused.* The seeds are similar to those of the closely related prostrate spurge (*E. maculata*) but distinctly larger. Seeds of the latter are not frequently harvested with those of crop seeds.

*Occurrence.* Nodding spurge seeds are most frequently found in those of forage legumes and grasses.

#### HEDGE BINDWEED AND MORNING-GLORY

(*Convolvulus sepium* and *Ipomoea* spp.)

(Figure 6)

*Other Common Names.* None.

*How Produced.* The seeds are formed in a capsule and released when mature.

*Size.* About 5 mm. in length, approximately 3.5 mm. in width.

*Shape and Appearance.* The seeds tend to be shaped like an orange section with two sides and a rounded back. When mature they are black with a finely granular or velvety surface.

Morning glory seeds are distinctly wedge shaped. The attachment scar is lateral at one end. Hedge bindweed seeds are the broader of the two; the wedge-appearance is less distinct as the back is bulged out in teardrop fashion. The large, reddish-brown rimmed scar is obliquely terminal.

*Seeds With Which Hedge Bindweed and Morning-Glory May Be Confused.* The primary noxious field bindweed, described earlier in this bulletin, possesses seeds of the same type as these species. Field bindweed seeds are distinctly smaller and gray in color with a roughened seed coat (fig. 6).

#### COMMON PLANTAINS (*Plantago major* and *rugelii*)

(Figures 31, 32)

*Other Common Names.* Broad-leaved plantain, Rugels plantain, black-seeded plantain (*P. rugelii*); ripple-seed plantain (*P. major*).

*How Produced.* Numerous small seeds are formed in a capsule-like fruit. At maturity, the top of the capsule comes off like a lid, releasing the seeds. Seeds may be ripened throughout much of the growing season.

*Size.* 1.0 to 2.0 mm. long; 0.5 to 1.0 mm. wide.

*Shape and Appearance.* The seeds are small, longer than wide, frequently pointed at ends, with a whitish scar



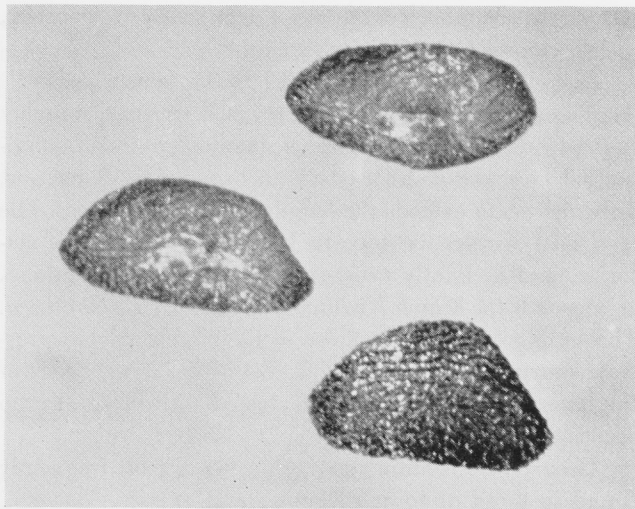


Fig. 31. Ripple-seed plantain. (Magnified 21 times actual size.)

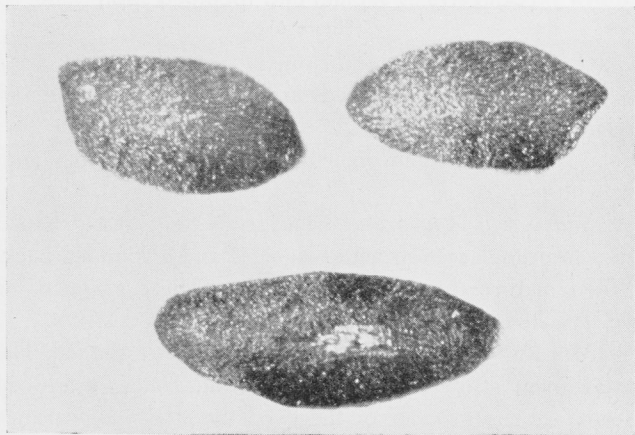


Fig. 32. Rugels plantain. (Magnified 21 times actual size.)

in the middle of one of the faces. Beyond this, no description is possible; every seed has its own individual shape (see examples in fig. 31). *Plantago rugelii* usually has blackish seeds which average the larger of the two; those of *P. major* are brown.

**Occurrence.** Common plantain seeds are usually found with those of forage legumes and in turfgrass mixtures.

#### COMMON RAGWEED (*Ambrosia elatior*)

(Figure 33)

**Other Common Names.** Ragweed.

**How Produced.** Ragweed seeds are produced in small clusters below the long spikes of pollen-forming flowers. They mature in late summer and early fall.

**Size.** Unhulled seed 3.0 to 3.5 mm. long; if hulled out, 2.0 to 2.5 mm.

**Shape and Appearance.** The seeds are roughly egg-shaped. At the top (broader end) there is a circle of short

projections and a conspicuous central beak. The color ranges from light tan to brown, sometimes becoming gray with age.

Frequently in small-seeded crops, the outer covering (involucre) of the seeds is destroyed and the inner seed structures are hulled out. These hulled seeds are egg-shaped (ovoid), a somewhat shiny brown, and lack the beaks of the unhulled seeds.

Hulling may go one step further. In seeds of various clovers and alfalfa one often finds soft, greasy, dull-green objects of about the same shape as the hulled seeds. These are ragweed embryos, stripped from their seed and fruit coats (see fig. 33). In this condition they soon die and are considered to be inert matter rather than weed seeds.

**Seeds With Which Ragweed May Be Confused.** Giant ragweed (*Ambrosia trifida*) seeds resemble those of common ragweed except for size; they are several times larger. They are not often found in crop seed.

**Occurrence.** Ragweed is abundant throughout Iowa. It grows in a wide variety of habitats. Its seeds are common in those of forage legumes and grasses. The Iowa State University laboratory has sometimes received "clover" samples for testing which were more than 50 percent ragweed.

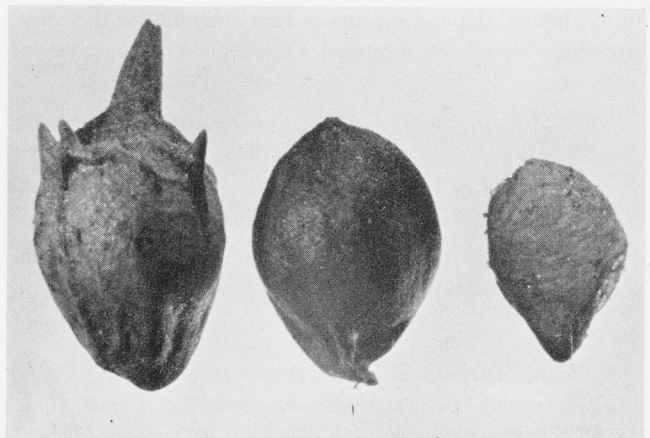


Fig. 33. Common ragweed. Left, entire seeds with outer hull. Middle, seed with inner hull. Right, hulled seed. (Magnified 10 times actual size.)

#### FOXTAILS (*Setaria* spp.)

(Figures 34, 35, 36, 39)

**Other Common Names.** Bristlegrass, pigeon grass.

**How Produced.** The seeds are borne in a dense, bristly, cylindrical spike. At maturity in midsummer to fall the seeds "shatter" and fall to the ground.

**Size.** Foxtail seeds range from about 2.0 to 2.5 mm. in length and 1.0 to 1.8 mm. in width. They are about the size of red clover seeds, some a little larger and some smaller.



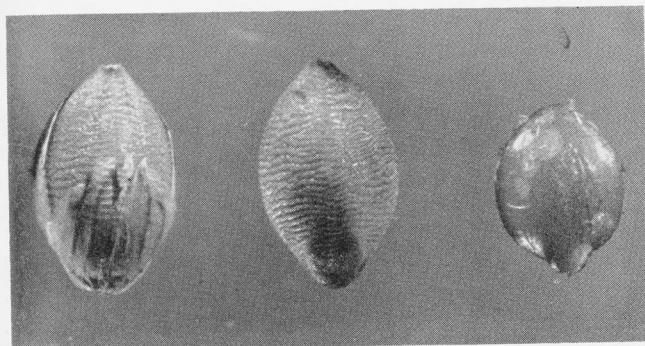


Fig. 34

Fig. 34. Yellow foxtail, the three seed forms. Left, entire spikelet. Center, floret. Right, hulled grain. (Magnified 10 times actual size.)



Fig. 35

Fig. 35. Spikelets of foxtails. Left, yellow foxtail. Center, giant foxtail. Right, green foxtail. (Magnified 10 times actual size.)

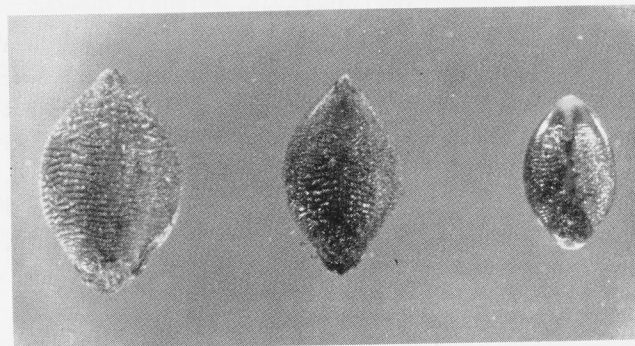


Fig. 36

Fig. 36. Florets of foxtails. Left, yellow foxtail. Center, giant foxtail. Right, green foxtail. (Magnified 10 times actual size.)

**Shape and Appearance.** The foxtail seed is turtle-shaped; that is, it has a flat bottom and a convex back. Usually it is broadly rounded at one end and tapered or pointed at the other. As produced on the plant, it consists of a grain surrounded by two sets of hulls (a one-seeded spikelet). This seed unit may remain intact, or one or both sets of hulls may be removed as a consequence of harvesting and processing. Foxtail seeds may, therefore, possess three different appearances depending upon the degree of stripping. These are:

1. The entire spikelet partially or completely covered by three papery, straw-colored hulls (the glumes). These structures possess distinct longitudinal nerves.

2. The grain surrounded by the inner hulls (lemma and palea). This unit, called the floret, is revealed when the glumes are removed. The inner hulls are thick and hard. They appear roughly granular under slight magnification and may be coarsely cross-ridged or corrugated. Their color varies ranging from straw to dark brown or mottled.

3. The grain. If the hard glumes are torn away, as often happens in smaller seeded crops, the true grain remains. It is turtle-shaped, greasy-gray-green with a conspicuous germ on the back.

**Three Kinds of Foxtails.** Three kinds of foxtails are important and abundant summer weeds in Iowa. The differences are as follows:

1. Yellow foxtail (*Setaria lutescens*) is the largest,

especially the broadest, of the three. Its length is about 2.5 mm.; width, nearly 2.0 mm. The outer papery hull (glume) on the back covers only the lower half of the seed. The top part of the inner hull (lemma) can be seen even though the glumes are still intact. The lemma is coarsely cross-ridged, solid-colored, light to dark, depending upon maturity of the seed.

2. Giant foxtail (*Setaria faberii*) is the middle-sized seed, about as long as yellow foxtail but narrower, 1.2 to 1.5 mm. wide. The outer glume is usually about 4/5 of the seed. The lemma is granular, sometimes cross-ridged, but less so than yellow foxtail.

3. In green foxtail (*Setaria viridis*) the outer papery glumes completely cover the intact spikelet. However, these glumes are frequently stripped off in processed seed with the lemma exposed to view. The lemma is finely granular, smoother than in the other kinds and not cross-ridged. The color ranges from yellowish-green in immature seeds to brownish-black mottled in fully ripe seeds. A shiny line along the bottom margin is often visible if the floret is turned upside down.

**Occurrence.** Yellow and green foxtail are among the most common annual weeds throughout Iowa. Giant foxtail is most prevalent in the southern half of the state. Foxtail seeds are abundant in both those of small- and large-seeded crops. Usually the entire seed (spikelet) is encountered in soybeans. In clovers and small-seeded grasses, the hulled florets or grains are frequently observed.

## WITCHGRASS (*Panicum capillare*)

(Figures 37, 39)

*Other Common Names.* None.

*How Produced.* The seeds (one-seeded spikelets) are produced singly at the tip ends of branchlets in an open-branched inflorescence.

*Size.* Witchgrass seeds range from 1.2 to 2.0 mm. in length, depending upon the number of surrounding hulls at maturity. They are 0.5 to 0.7 mm. wide.

*Shape and Appearance.* Like those of the foxtails, the seeds may be found in any of three forms: (1) the entire spikelet<sup>7</sup> with papery, outer hulls, (2) the floret with a hard, thick hull, (3) the hulled grain.

The spikelet is narrowly ovate, usually tapering to a pointed tip. It is straw-colored, and about 2 mm. long. The floret form is shorter and ovate; both faces are somewhat convex and glossy. The color of the floret depends upon the stage of maturity. Young seeds are light straw-colored. Mature seeds are brown with 3 to 5 light, longitudinal stripes on the back. The hulled grains are turtle-shaped, usually ivory-white.

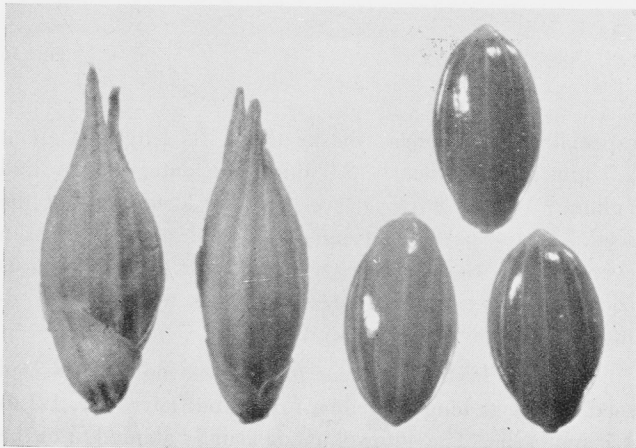


Fig. 37. Witchgrass. Left, spikelets. Right, florets. (Magnified 26 times actual size.)

*Seeds With Which Witchgrass May be Confused.* The seeds of fall panicum (*Panicum dichotomiflorum*) are thinner than those of witchgrass, but are otherwise very similar. This weed is common in much of Iowa. Due to a low or semi-prostrate habit in contrast to the erect growth of witchgrass, the seeds are not as frequently harvested as those of witchgrass. For practical purposes, any seeds as described above may be considered to be those of witchgrass.

*Occurrence.* Witchgrass is one of the most common late summer annuals. It is abundant throughout Iowa in a variety of crops and habitats. The seeds are most common in those of small-seeded legumes and the late-summer-harvested grasses.

<sup>7</sup> Technical terms are used as defined under discussion of the foxtail grasses.

## BARNYARD GRASS (*Echinochloa crusgalli*)

(Figures 38, 39)

*Other Common Names.* Watergrass.

*How Produced.* The seeds are borne in one-seeded spikelets as with the foxtails and witchgrass.

*Size.* Length, 2.2 to 2.0 mm.; width, about 1.5 mm. These measurements do not include the bristle or awn which is frequently present. Length may be as much as 10 mm. The seeds are about as large as those of yellow foxtail; they are conspicuously larger than either green foxtail or witchgrass.

*Shape and Appearance.* The structure of the seeds is

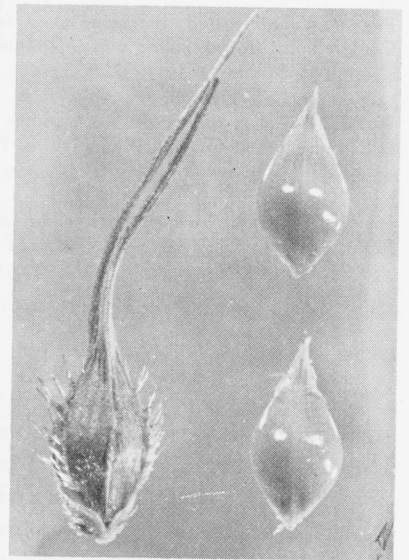


Fig. 38. Barnyard grass. Left, spikelet. Right, florets. (Magnified 9 times actual size.)

the same as for foxtails and witchgrass. They may be found in any of three forms: the entire spikelet, the floret or the hulled grain.

In general outline, the spikelets are ovate and turtle-shaped (plano-convex) with a rounded back and a flat bottom. The outer hulls (glumes) of the spikelet are papery and frequently, but not always, covered with bristles. They are often tipped by a long sticker or bristle

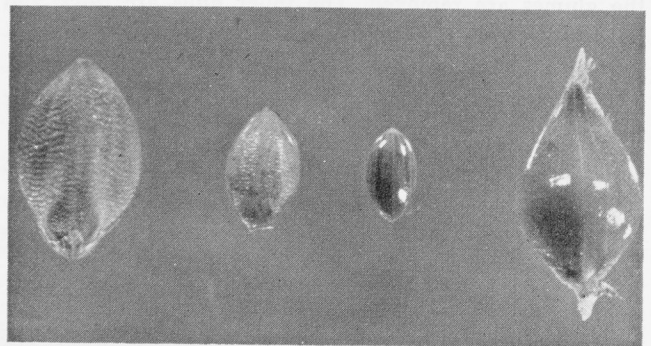


Fig. 39. Foxtails, witchgrass, barnyard grass. Comparison of size. Left, yellow foxtail. Middle left, green foxtail. Middle right, witchgrass. Right, barnyard grass. (Magnified 10 times actual size.)



(awn). This structure is usually broken off after the seeds have been handled with crop seeds.

If the glumes are stripped off, the seed is the hard, shiny, smooth floret. Immature florets are light colored; mature ones are ivory to brownish. The hulled grain is similar to yellow foxtail in size and shape, but tends to be whitish in color.

*Seeds With Which Barnyard Grass May Be Confused.* None.

*Occurrence.* This plant is another common mid- to late-summer grassy annual growing throughout Iowa. It is most abundant in heavy soils. The seeds may be found with those of almost any Iowa-produced seed, ranging from soybeans to red clover.

### CRABGRASS (*Digitaria* spp.)

(Figure 40)

*Other Common Names.* None.

*How Produced.* The seeds are small one-seeded spikelets, a grain surrounded by two sets of hulls. The same kind of a seed is borne by the foxtails, witchgrass and barnyard grass.

*Size.* Crabgrass seeds are small, about the same size as those of witchgrass and distinctly smaller than the foxtails or barnyard grass. There are two kinds which differ slightly in length. Crabgrass (hairy or large crabgrass) 2.0 to 2.5 mm. long, 0.5 to 0.7 mm. wide; smooth (or small) crabgrass, 1.5 to 1.8 mm. long, 0.7 to 0.8 mm. wide.

*Shape and Appearance.* The two crabgrasses have the following characters in common:

They are ovate to narrowly ovate in outline, somewhat turtle-shaped with a flat bottom and a rounded top. The outer hulls (glumes) are papery with fine hairs (magnification is needed to see this). The inner hull (lemma) is thick and firm, neither roughened or shiny. The grain resembles that of witchgrass. It is small, turtle-shaped and usually whitish.

Crabgrass seeds may occur in crop seed as the entire



Fig. 40. Crabgrasses. Left, spikelets. Right, florets. In each group, hairy crabgrass to the left; smooth crabgrass to the right. (Magnified 14 times actual size.)

spikelets; or the glumes may be partially or completely destroyed. The hard lemma and palea are usually persistent, and hulled grains are not often found.

The two crabgrasses differ as follows:

Hairy crabgrass (*Digitaria sanguinalis*) seeds are the longer and more slender of the two. The glume (outer hull) on the back side is narrow and short, extending only about half the length of the spikelet. Hence, a large portion of the inner hull (the lemma) is exposed to view even though the glume is still present. The glume is characteristically an olive-drab. It may be lighter if the seed is immature.

Smooth crabgrass (*Digitaria ischaemum*) seeds are broader and shorter. The glumes cover the spikelet; hence, the inner hulls are not exposed to view unless the glumes are broken or destroyed. The lemma is black at maturity, brownish when unripe.

*Occurrence.* Crabgrasses are among the most common weeds in Iowa from cornfields to lawns. Their seeds may be found with those of nearly any crop.

### JAPANESE BROME (*Bromus japonicus*)

(Figures 41, 42)

*Other Common Names.* Wild brome, cheatgrass.

*How Produced.* The seeds are formed in clusters (several-seeded spikelets) at the tips of the inflorescence branches. At maturity in early to midsummer the spikelets break into one-seeded units.

*Size.* The seed is 6.0 to 7.0 mm. long with a terminal bristle of about equal length. The bristle (or awn) may or may not be broken off in processed seed. The apparent width, 1.0 to 2.5 mm., depends upon the extent to which the hulls surrounding the grain are laterally flared out.

*Shape and Appearance.* The seed is roughly boat-

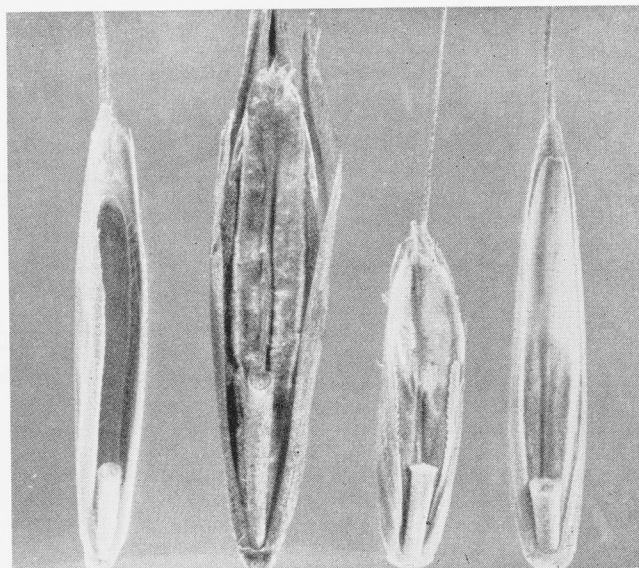


Fig. 41. Japanese brome and similar seeds. From left to right, Japanese brome, smooth brome, ryegrass, quackgrass. (Magnified 9 times actual size.)



shaped. It consists of a grain with its back covered by a larger hull (the lemma), and its front or inner side covered

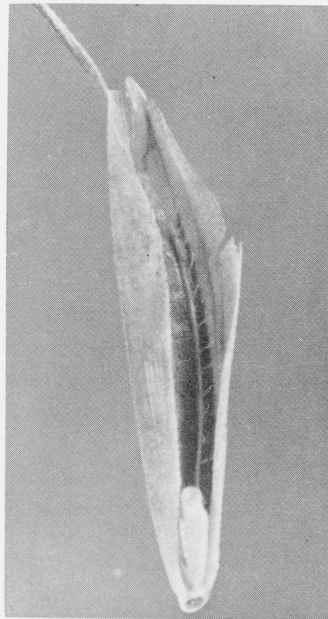


Fig. 42. Japanese brome. Note rachilla at base of seed and bristles along margin of palea. (Magnified 10 times actual size.)

by the palea. The tip of the lemma is prolonged into the awn. The marginal edges of the palea possess a distinctive row of slender bristles. At the bottom end of the seed opposite the awn is a short stalk-like structure, the rachilla,

attached at the base and extending up for a short distance.

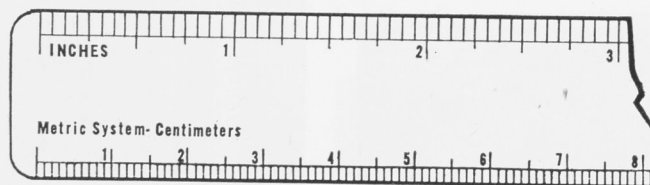
In small-seeded crops, the grain may be hulled out. It is oblong, distinctly boat-shaped and light brown.

*Seeds With Which Japanese Brome May Be Confused.*

Japanese brome seeds bear a general resemblance to those of a number of other seeds which possess a rachilla, such as quackgrass, fescues, ryegrass and smooth brome. One who has worked with these seeds can quickly recognize the Japanese brome. The seeds appear thin and fragile. The awn is usually curved backward; the lemma is much broader than the grain and often flared outward.

The rachilla provides more sharply defined identification characters. It is bowed well away from the palea. The scar at the apex of this structure is vertical to the long axis of the seed. Furthermore, none of the other seeds possess slender palea bristles (see fig. 42) as described above. All of these latter characteristics require magnification but make possible positive identification.

*Occurrence.* Japanese brome grows throughout Iowa in a variety of situations. Its seeds may be found in those of several crops. However, its greatest importance as a weed is in smooth brome. The seeds are not easily removed from those of the crop kind by cleaning processes. The Iowa Crop Improvement Association essentially treats Japanese brome as a noxious weed, inasmuch as it establishes limits on seeds of this weed.



Comparison of English and metric measurements.

## GLOSSARY

*Attachment scar (seed)* — Place where seed was originally attached to the fruit or pod.

*Barb* — A sharply pointed bristle.

*Berry* — A fleshy or succulent fruit with several seeds.

*Bract* — A scale or hull.

*Bur* — A spiny structure containing one or several seeds.

*Capsule* — A seed pod containing several seeds which breaks open at maturity, releasing the seeds.

*Dehiscent* — Descriptive of a fruit which breaks open at maturity, releasing the seeds; e. g., a bean pod or a butterprint capsule.

*Ellipsoidal* — Football shaped.

*Flange* — A raised rim or border.

*Glumes* — The pair of outer hulls of a grass spikelet. The glumes may enclose the entire spikelet in clamshell fashion (e.g., foxtails). Alternatively, if the spikelet bears several seeds (e.g., quackgrass), the glumes surround only the bottom portion.

*Granular* — Finely roughened, like fine sandpaper.

*Hull* — The outside coat or covering.

*Hulled (seed)* — A seed in which the outer covering, or hull, has been removed.

*Indehiscent* — Descriptive of a fruit which does not open at maturity and release the seeds.

*Inflorescence* — The flower-bearing portion of a plant.

*Lemma* — The larger of the two hulls of a grass floret.

*Lobe* — A rounded projection.

*Longitudinal* — Extending parallel to the long axis.

*Mottled* — Irregularly spotted with two or more colors.

*Oblong* — Narrow, with parallel sides.

*Ovate* — Egg-shaped in outline, one end broader than the other.

*Palea* — The smaller of the two hulls of a grass floret.

*Pistil* — The female seed-producing organ of the flower. After pollination and fertilization, the lower portion of the pistil (the ovary) normally develops into the fruit.

*Plano-convex* — With a flat bottom and a curved (convex) back; turtle-shaped.

*Prominence* — A tiny raised area or bump.

*Rachilla* — A small stalk attached at the bottom of certain grass seeds and closely pressed against the face of the seed (see fig. 3).

*Sepals* — The outer greenish flower parts, usually those which protect it in bud.

*Spheroidal* — Shaped like a globe or sphere.

*Spike* — A dense, usually elongate cluster of flowers or seeds (e.g., a head of wheat).

*Spikelet* — The seed-containing unit of the grasses. Depending on the grass, the spikelet may contain several seeds (e.g., brome grass), or only a single seed (foxtail grass). In the latter instance, the one-seeded spikelet is commonly termed the seed.

*Stigma* — The tip or tips of the flower pistil. Pollination involves the transfer and adherence of pollen to the stigma.

*Taper* — To gradually become narrow.

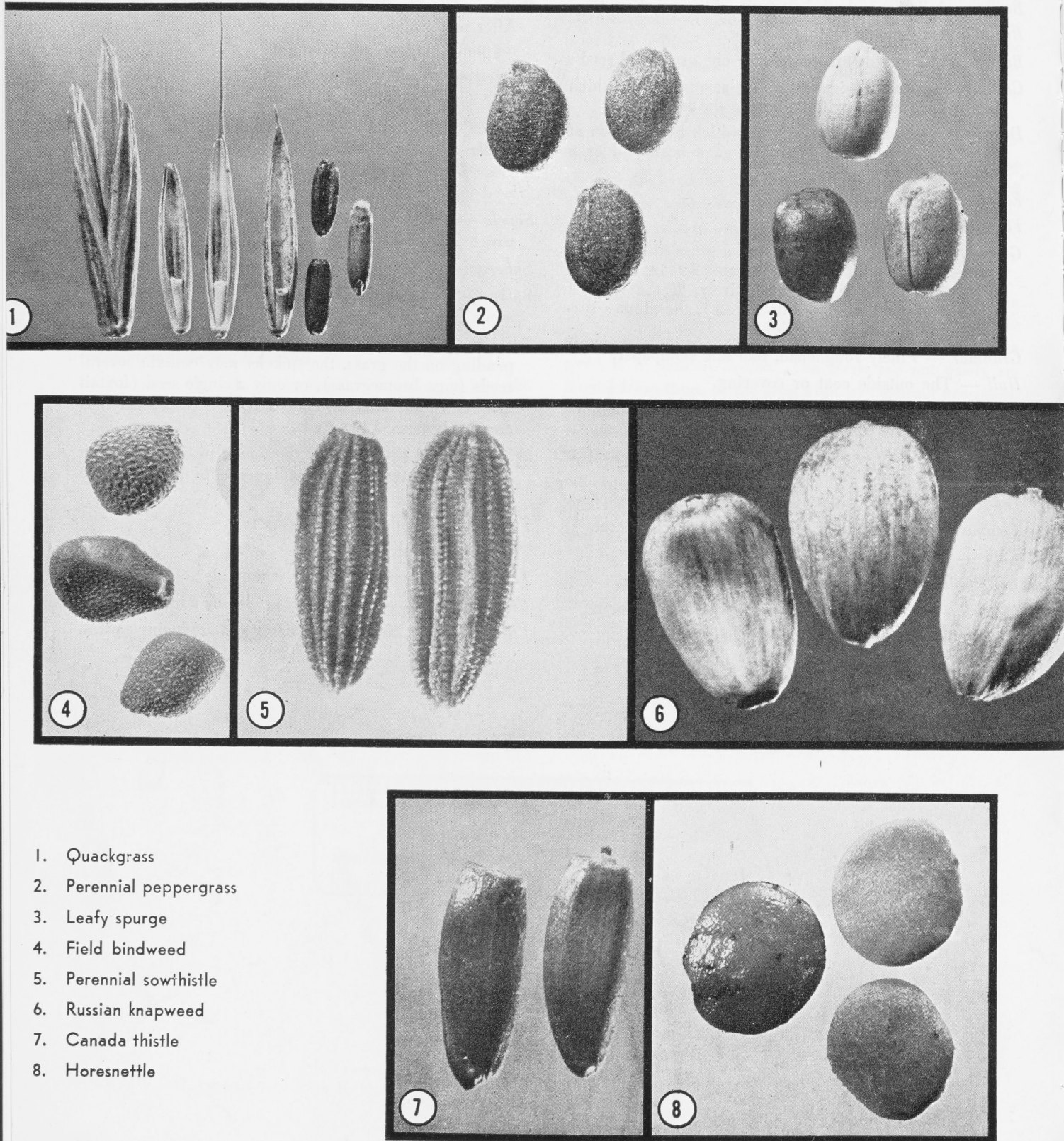
*Truncate* — With a blunt tip.

*Tubercle* — A small knob-like structure.

*Unhulled (seed)* — A seed surrounded by a hull.

*Viable* — Alive; capable of growing and producing a plant.

# PRIMARY NOXIOUS WEED SEEDS



1. Quackgrass
2. Perennial peppergrass
3. Leafy spurge
4. Field bindweed
5. Perennial sowthistle
6. Russian knapweed
7. Canada thistle
8. Horesnettle